Extension Bulletin

Good Agricultural Practices for Aloe

ICAR

ICAR – DIRECTORATE OF MEDICINAL AND AROMATIC PLANTS RESEARCH

BORIAVI, ANAND – 387 310, GUJARAT

Good Agricultural Practices
for
Aloe

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Aloe plant

Aloe leaf

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FOREWORD

Medicinal plants are mainly collected from forest with destructive harvesting methods. This resulted into dwindling natural resources, reduced biodiversity and irregular supply. Cultivation of medicinal plants ensures sustainability and uniformity of the plant material thus, ensuring quality of raw drugs. Good agricultural practices (GAP) are the pre-requisite for the medicinal plants cultivation and certification to produce good quality raw drugs.

Aloe (Aloe barbadensis) is a perennial, shallow rooted and xerophytic plant. It is grown commercially for its high demand in cosmetic industries as well as in Indian System of Medicines. Aloe juice from leaves is used as laxatic, stomachic, aphrodisiac, cathartic, emmenagogic, astringent, antidotal, anthelmintic and hepatic stimulant. Aloe gel is used in cosmetic industry for preparation of shampoo, face creams and moisturising agents. Aloe gel is also given in fever, enlargement of liver, spleen and other glands, skin diseases and for the treatment of burns and bruises.

I am happy that ICAR- DMAPR, Anand has taken an initiative in compiling and publishing this extension bulletin that would serve as useful guide to the aloe cultivators for the production of better yield and quality raw material..

(Jitendra Kumar)

Anand

Date: 24-11-2014

Good Agricultural Practices for Aloe

1. Name of the plant

1.1 Scientific name: *Aloe barbadensis* Mill.

1.2 Local name

English: Aloe barbadosaloe, Curacao aloe, Jaffarabad aloe and Indian Aloe

Hindi: Kunvar pathu and Gheekanvar

Sanskrit: Ghrit kumari

Kannad: Lolesara

Tamil: Thazhai

2. Plant parts used for medicinal purpose

Aloe leaves are used for medicinal and cosmetic uses.

3. Uses

In India, it is grown commercially for its high demand in cosmetic industries as well as in Indian System of Medicines. The succulent leaves are economic part of this plant. The characteristic bitter aloe juice from leaves is laxatic, stomachic, aphrodisiac, cathartic, emmenagogic, astringent, antidotal, anthelmintic and hepatic stimulant. The gel produced from mature leaves is used in cosmetic industry for preparation of shampoo, face creams and moisturising agents. Aloe gel is also given in fever, enlargement of liver, spleen and other glands, skin diseases, gonorrhoea, constipation, menstrual suppressions, piles, jaundice, rheumatic diseases, and for the treatment of burns and bruises.

4. Characteristics of the plant

Aloe barbadensis Mill. popularly known as aloe, is perennial, shallow rooted and xerophytic plant of 30-60 cm height. The plant has triangular fleshy leaves with serrated edges, yellow tubular flowers, and fruits contain numerous seeds. Each leaf is composed of three layers: An inner clear layer of gel that contains 99% water and rest is made of glucomannans, amino acids, lipids, sterols and vitamins. The middle layer of latex contains bitter yellow sap and anthraquinones and glycosides. The outer thick layer called as rind which has protective function and synthesizes carbohydrates and proteins. Inside the rind there are vascular bundles which are responsible for transportation of substances such as water (xylem) and starch (phloem). Flowers vary from yellow to rich orange in colour and arranged in axillary spikes. Flowers have 6 stamens and a trilocular overy. Mostly flowers are male or sterile with scarcely fertile pollens.

5. Major production areas

Aloe is originated from warm and dry climate of Africa. However, because of its wide adaptability as well as its importance as medicinal plant, it is well distributed throughout the world. History showed its importance that Egyptian queens Nefertiti and Cleopatra used

it as part of their regular beauty package and Alexander the Great and Christopher Columbus used it to treat their soldiers' wounds. It grows mainly in the dry regions of Africa, Asia, Europe and America. In 16th century it is reached to India and inspired growers for commercial cultivation in many parts of the country due to its multifarious uses as; medicinal plant, vegetable, pickle purposes etc. In India, it is cultivated in Rajasthan, Andhra Pradesh, Gujarat, Maharashtra and Tamil Nadu.

6. Cultivation methods

6.1 Climate

It can be grown in almost all parts of India, even under constant drought conditions. However, the crop grows well in entire tropical and sub-tropical regions with mean annual rainfall of 35-40 cm. Since its water requirement is very low, it is best suited for cultivation in arid and semi-arid regions particularly in Rajasthan, Gujarat, Madhya Pradesh and Maharashtra.

6.2 Soil

It is successfully grown on marginal to sub marginal soils having low fertility. The plants have tendency to tolerate high pH with high sodium and potassium salts. However, it is observed that its growth is faster under medium fertile heavier soils such as black cotton soils of central India. Though, well drained loam to coarse sandy loam soils with moderate fertility and pH up to 8.5 are most suitable for its commercial cultivation.

6.3 Land preparation

The soil should not be disturbed too deep as the root system of aloe does not penetrate below 20-30 cm. Depending upon the soil type and agro-climatic condition, 1-2 ploughing followed by levelling should be done. Field should be divided into suitable size plots of 10-15 m × 3 m considering the slope and source of irrigation water. Apply farm yard manure at the rate of 10-15 tonne per hectare at the time of final ploughing and mix with the soil.

6.4 Planting time

Suckers are planted in the month of July-August during monsoon season for better field survival and subsequent growth of the plants. However under irrigated conditions, planting can be done throughout the year except in winter months (November-February).

6.5 Method of planting

Suckers are planted in about 15 cm deep pits made just at the time of planting at a spacing of 60 × 60 cm in the field. However, for obtaining higher leaf yield and monetary returns planting at 60 × 30 cm row to row and plant to plant spacing is advisable for its commercial cultivation. After planting the soil around the suckers are firmly pressed to prevent lodging of the plants. Also, insure the proper drainage in the field as the crop is sensitive to water logging.

6.6 Propagation material

Aloe is transplanted by suckers. About three to four months old suckers having 4-5 leaves and about 20-25 cm in length are used as planting material.

Suckers

6.7 Recommended varieties

Released varieties of aloe are not available in India for commercial cultivation. However, some high aloin containing (20.7-22.8%) genotypes such as IC 111267, IC 111269, IC 111271, IC 111273, IC 111279, IC 111280, IC 112521, IC 112532, IC 112531, IC 112527, IC 112517, INGR 06023, INGR 06024 and INGR 13043 can be used as source of planting material of aloe.

6.8 Seed rate

About 37,000-56,000 suckers are required for one hectare area depending upon planting density.

6.9 Crop nutrition:

Use of organic manures (farm yard manure, compost, vermi-compost, poultry manure, green manure) is preferred for growing of medicinal plants. Application of 10-15 tonne of farm yard manure per hectare at the time of soil preparation and also in subsequent years is

recommended to harvest good crop. It is also recommended to apply vermicompost 2.5-5.0 tonne per hectare for obtaining higher leaf yield and monetary returns. However, mineral nutrition may also be supplemented through inorganic sources considering the requirement.

6.10 Irrigation

Aloe crop can withstands stress conditions very well but to get good crop irrigation at critical stages of growth must be given. First irrigation is required just after planting of suckers followed by 2-3 irrigations depending on the rains till plant get established. However, 4-6 irrigations except monsoon season per year may be enough for good crop growth. After each picking of leaves light irrigation should be given depending upon the availability of water.

6.11 Intercultural operations and weeding

The field should be kept free from weeds throughout the growing period of the crop. Two to three hand weeding followed by light hoeing per year promote growth and suckering in aloe. First weeding-cum-hoeing should be completed within a month after planting. However, in subsequent years two weeding-cum-light hoeing in each year found to be sufficient to minimize the weed population in the field. Unproductive and diseased plants and dried flower stakes should be removed regularly from the field.

6.12 Intercropping

During the first year of planting, more than 40% land remains unutilized which can be used for the cultivation of other crops of the season. Leguminous or less competitive intercrops like cluster bean, groundnut, sesame, isabgol, coriander, cumin etc. can be grown successfully in the interspaces available under arid and semi-arid condition that can improve the soil health and generate additional income. Second year onwards such crops should not be encouraged otherwise foliage yield and quality of the produce will be adversely affected.

6.13 Insect pests and diseases management

Not much problems of insect pests and diseases have been observed in this crop from any part of the country. However, mealy bug, anthracnose and leaf spots have been reported from some parts of the country. Sometimes termite problem has also been observed which can be easily managed by giving a light irrigation.

6.14 Harvesting

Harvesting is a labour intensive operation in aloe cultivation. The thick fleshy leaves are ready for harvest after 8 months of planting. The crop can be harvested up to 5 years after planting. Normally, three harvests are taken in a year by removing three to four leaves per plant. Harvesting should be done either in the morning and/ or evening hours. Harvesting at full flowering produce maximum leaf, gel dry weight, gel/leaf weight and powder yield. However, highest leaf aloin content is found at pre-flowering stage. In general, the best time of harvesting is early flowering to obtain maximum economical yield of aloe.

7. Post harvest processing

The term 'Aloe' used in medicine stands for the dried juice, which flows from the transversely cut bases of the leaves. Fully developed mature leaves should be harvested for extraction of aloe juice. For processing of aloe, the juice is allowed to drain out from the cut leaves into vessels and then concentrated by evaporation either spontaneously or frequently by boiling. The juice is colourless or yellow when obtained fresh from the leaves but becomes dark brown due to evaporation and boiling.

Besides the dry juice, gel is also very important product of aloe. The mucilaginous pulp from the leaf is used in cosmetic industries and also in treatment of many human diseases. The leaves left over after the removal of their exudates is cut open and mucilage is scraped out with a blunt edged knife for the isolation of gel. Extracted mucilage is stirred vigorously in a blender to make it homogeneous mixture (solution). This mixture is strained with the help of a muslin cloth and then filtered. Then keep it for overnight and the gel is isolated by centrifugation. It is dried at a high temperature (below 100°C).

8. Documentation of activities

The documentation of all the activities starting from cultivation to post harvest processing should be in continuation and maintained properly. Records should be kept for each activity of cultivation such as planting, weeding, irrigation, harvesting, and of post-harvest processing after harvest to sorting, drying, grading, packing and

storage with details of time and type of activity that refers to a complete history and ensure traceability of the final product.

9. Yield and economics

An aloe plantation gives commercial yield from second year to fifth year of planting. Generally 3-4 pickings per year can be taken up depending upon the growth of plants. On an average 15-20 tonne per hectare fresh leaves are obtained from second year plantation. However, well managed irrigated crop can give up to 30-35 tonne per hectare fresh leaf yield.

A net profit of about ₹10,000-20,000 can be obtained from one hectare crop grown on marginal to sub-marginal lands.

10. Marketing

Marketing of leaves of aloe is not well organized in the country. However, in the recent past, a lot of interest has been showed for its cultivation as well as marketing looking to its international demand. Therefore, one should ascertain its demand in the local market or one must establish contact for its sale, before taking up its commercial cultivation.

11. Market demand

Aloe is among the few medicinal plants having both medicinal and cosmetic uses and thus, has extensive market across the globe. The major markets for aloe and its extracts are Australia, USA and the entire Europe.

12. Crop calendar

Major activity	Month	Activity details
Land preparation	June	Prepare the land by 1-2 ploughing followed by levelling. Divide the field into plots of 10-15 × 3 m depending on soil type and slope.
Planting Dry land and rain fed crop Irrigated crop	July- August Throughout the year except November-February	Use 3-4 months old suckers of 20-25 cm length. Planting should be done in 15 cm deep pits made at 60 × 30 cm apart in the levelled plots.
Irrigation	Summer months	First irrigation just after planting of suckers and subsequent irrigations depending on the monsoon rains. 4-6 irrigations per year are enough for proper growth of the plants. Light irrigation should be given just after each picking of leaves.
Intercultural operations	July-September	First weeding-cum-hoeing should be done within a month after planting followed by monthly weeding and hoeing during the monsoon season.
Spraying	Need based	As per the occurrence of disease and pest
Harvesting	Throughout the year	Start harvesting from second year onward. Take 3 harvests per year by removing 3-4 leaves per plant at pre-flowering stage. Harvesting should be done in morning and evening hours.
Post harvest operations	Throughout the year	Immediately after harvest transport the leaves to the processing unit for the extraction of juice and gel. Remove the dry and diseased leaves and wash the leaves.
Documentation	Throughout the year	All the activities from sowing to harvesting and post harvest processing should be documented

Note

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हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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